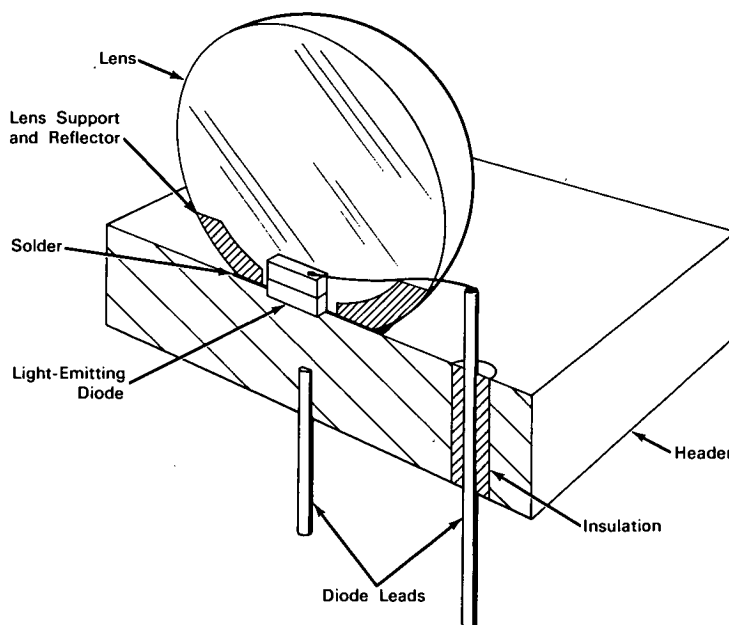


NASA TECH BRIEF



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Optical Arrangement Increases Useful Light Output of Semiconductor Diodes



The problem: Increasing the useful incoherent-light output of light-emitting diodes made of gallium arsenide or other semiconductor materials. The utility of these devices has been limited by the relatively low directivity of their light output.

The solution: Incorporating the diode in an integral reflector and lens assembly. This arrangement reduces the normal reflection losses between the diode and the air and results in an approximately 100% increase in the useful light output of the diode.

How it's done: The diode is centered in the aperture (recess) in a spherical lens, made of a thermosetting plastic having a high light transmissibility. A concave ring which serves as a reflector and lens support is bonded to the bottom of the lens in the area around the diode. The entire unit is mounted on an electrically conducting header by soldering or by any other standard method. The p-face of the diode is connected through the header to an external lead, and the n-face is connected to a filament which passes through the lens to a second external lead.

(continued overleaf)

For a gallium-arsenide diode, the diameter of the lens should be approximately six times the length of the diode (measured parallel to the junction between the n- and p-faces). The length of the diode should be approximately six times its thickness (measured along a perpendicular to the junction). A commercially-available thermosetting epoxy casting resin, which was used to make the lens, can be bonded to the diode and cured at 165° F for up to 24 hours without adverse effect on the characteristics of a gallium-arsenide diode.

Note: A related innovation is described in NASA Tech Brief B64-10297, December 1964. Inquiries may also be directed to:

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Reference: B65-10020

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: International Business Machine Corp.
under contract to Jet Propulsion Laboratory
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